Proposal Form

The Regents of the University of California
c/o Sponsored Projects Office
University of California, Berkeley Campus
Berkeley, California 94720-5940

to

Caltrans-New Technology

Entitled

Systems Engineering

UCB ITS 4878

SYSTEMS ENGINEERING

Principal Investigator: Martin Wachs

Period of Performance: ~~July~~ June 1, 2004 - June 30, 2005

INITIAL JK

Total Amount Requested: $175,000

6/11/04

Jannet Kim
Sr. Research Administrator
Sponsored Projects Office

Prepared by
California Center for Innovative Technologies (CCIT)
Institute of Transportation Studies

ProjectList CCIT

TASK ORDER 11

Date: 06/01/04

Contract No. 51 A 0255

Project Title: Systems Engineering

I. PROJECT GOAL/DESCRIPTION

The goal of this project is to evaluate Systems Engineering requirements relative to the California Department of Transportation's (the Department) business operations to meet federal requirements supporting ITS projects. The project will also attempt to evaluate larger implications of Systems Engineering for the Department's business operations in support of planning and project development cycles. Currently, the California Department of Transportation (Department) Division of Transportation Planning (DOTP) is undertaking an effort to incorporate Intelligent Transportation Systems (ITS) into the mainstream of the planning, project development, and overall business operations for the Department. The Department needs to evaluate the Systems Engineering process and its application in order to meet federal requirements and support planning, development and programming of ITS projects.

Currently there is not adequate staffing available within the department to coordinate a departmental effort to model and implement the Systems Engineering requirements and assess the Systems Engineering implications on the Department's decision-making process. The support of the University of California and consultant staffing is required to determine what it takes to adopt and implement the Systems Engineering method within the Department and what impacts it may have on the various programs and operations.

A. This Task Order is entered into pursuant to the provisions of the Interagency Agreement No. 51A0255 between the California Department of Transportation, hereinafter the Department, and the Regents of the University of California at Berkeley, hereinafter UCB. This Task Order implements, and is hereby made part of, the said Agreement.

B. UCB shall provide the Department with the services described hereafter and in accordance with the terms, conditions, and understandings hereafter specified.

C. The term of the Task Order is from (06/01/2004) through (06/30/2005).

II. SCOPE OF SERVICES

BACKGROUND

According to federal law, (FHWA CFR 23, Subchapter K, ITS Section 940.11, Project Implementation) all Intelligent Transportation System (ITS) projects funded with highway trust funds shall be based on Systems Engineering analyses. The due date for regional/state compliance with ITS architecture is April 2005. The desired outcome is to integrate and build upon regional ITS plans and architectures (frameworks) that are customer-focused by utilizing the Systems Engineering approach.

ITS architecture defines the systems and plans the interconnections and information exchanges between the systems. ITS are actual tangible elements and systems that use electronics, communications and information processing to improve the efficiency and safety of surface transportation. Systems Engineering is a structured process for arriving at the final design of a system that is selected from a number of alternatives and considers the life cycle of a project.

List of Tasks

The Tasks listed herein are to be the responsibility of UCB and will be performed by its staff, or other UC campus and/or commercial transportation experts as subcontractors to UCB. It is the intent of the project management to use and bring to the project the latest and most updated and cutting edge technology available to accomplish the project goal.

Activities stated in this task order are types of work envisioned to achieve the project objectives. UCB, however, is required to develop a comprehensive work plan (to be approved by the project monitor) to ensure all the requirements and processes are in place to successfully complete the project. UCB will receive project direction and input from the advisory group (s) and DOTP project management through the project monitor.

Overall, the project has the following interrelated primary and secondary objectives that may have to be phased or addressed concurrently. The decision to phase the project will be made in consultation with the Contractor based on the most cost effective and substantive approach to the project.

a) Primary Objective: Evaluate Systems Engineering requirements relative to the Departments' business operations to meet federal requirements supporting ITS projects.
b) Secondary Objective: Evaluate larger implications of Systems Engineering for the Department's business operations in support of planning and project development cycles.

The focus of the report is on compliance with the systems engineering requirements supporting ITS and generating detailed analysis while the application of the model for the Department's decision process will also be broadly assessed. UCB is required to prepare a detailed work plan in response to this task order as to what are the specific work elements that would satisfy the intent of this study and what are the steps the consultant is going to take to conduct the study, including deliverables. The work plan must be approved by the Department's project manager prior to proceeding with the study. The following, however, provides a framework for the work element requirements and deliverables.

UCB with the support of a Consultant will develop questionnaire and convene interviews and meetings with various Headquarters and districts programs as an input to the assessment and generate appropriate meeting notes, data, issue papers needed to support effective project development and presentations including:.

1. Optimum use of visuals, tables, charts, flow charts and other visual aids as required to ensure message is clear.

2. The development of a template, glossary, definition and guidelines for the Department's staff to follow in order to define what constitutes an ITS project and how to adopt Systems Engineering requirements.

Task 1– Compliance Evaluation

Evaluate the Department's current project development process: from project initiation in the planning stage through to the final project construction and beyond to operations and maintenance, and compare with Systems Engineering steps or procedures. Document the process comparison and develop recommendations and the steps needed to accomplish compliance goals. Analyze the impact on functional Divisions, and how that might impact the Department, as well as state, metropolitan and regional agencies' plans and programming processes.

Compare Systems Engineering with the Department's current Work Flow Task Manual (WFTM), Project Development Procedures Manual (PDPM), Selection of Alternatives, Project Management Practices, Risk Management, Quality, Cost/Benefit Analysis, Value Engineering and other current Department's practices, procedures and mandates that may need updating to meet the Federal Requirements for Systems Engineering. Compare the ITS life cycle process and relationship to Department's project development process. Identify and compare each phase and identify key milestones and decisions points.

Assure and compare the Systems Engineering process is in compliance with the regional transportation agency's ITS architectures in the state of California. Assess what Systems Engineering compliance means to different programs within the Department and what types of activities are needed to support and maintain this implementation. Contact with other Divisions, such as Traffic Operations, Maintenance, Operations, Design, Construction, Planning, and others will be required to assess how integrating Systems Engineering into the Department's current process will impact the Department.

Delineate analysis and requirements from the ITS project perspective according to the federal requirements and the potential application of Systems Engineering to support planning and project development and the Department's overall business operations. Produce separate findings concerning primary and secondary objectives stated at the beginning of this section. Evaluate questions such as: "Does deployment of systems engineering only for ITS projects lead to establishing a two-track or separate decision process for ITS versus non-ITS projects; thereby, creating inconsistencies in the decision process? Are there project exemptions or does it make sense to grandfather certain projects to avoid the systems engineering process"?

Deliverable: Document containing detailed analysis and recommendations on how the Department can meet the FHWA's mandates and deadline that all ITS projects funded by state highway funds shall be based on System Engineering analyses.

Task 2– Systems Engineering Model

Create a custom-tailored Systems Engineering model that would allow the Department to implement a system engineering process. It should address how this model can best

serve the regions of California and the Department and to meet their mission statement, visions and goals related to ITS projects, and in the future, for all transportation projects.

Deliverable:
A model for the Department to follow that would allow the Department to implement a system engineering process and compare system engineering with the Department's current business and project development process and regional architecture for ITS projects and future applications for all transportation projects within California.

III. REPORTS AND/OR MEETINGS

A. UCB shall submit progress reports in accordance with the following schedule.

B. UCB's Principal Investigator shall meet with the State's Contract Manager or Contract Monitor as needed to discuss progress on the projects(s).

C. Each quarter, UCB agrees to provide the Department with a quarterly progress report signed by the Principal Investigator and a quarterly financial report which includes a schedule of disbursements signed by the Principal Investigator or his designated representative in accordance with Exhibit B – Budget Detail and Payment Provisions, of this Interagency Agreement.

D. UCB/CCIT must provide timely reports to the Department and others that follow this program. At a minimum, the UCB/CCIT Research Center shall submit the following reports:

1. Four printed copies of the quarterly progress report on or before the first of each August, November, February, and May during the period in which the project is being performed.

2. One printed copy of the quarterly financial report on or before the fifteenth (15^{th}) of each August, November, February, and May during the period in which the project is being performed.

3. Three copies of the final report on the work authorized under this Agreement on or before the end date of the Agreement. Two copies of a draft final report will be submitted to the Department for review and comment forty-five (45) days before the final report is printed.

E. The University's Sponsored Programs Director will meet with all parties as needed to keep the project coordinated.

F. Copies of all invoices, quarterly financial reports, quarterly progress reports relating to this project, and any required supporting documentation shall be sent to:

Mr. Fred Dial
Department of Transportation
1120 N Street, MS 36
Sacramento, CA 95814
Public Telephone: (916) 654-6101
Calnet Telephone: (8) 464-6101
Facsimile: (916) 654-5452

G. When the Task Order calls for a product or a report, the Department agrees to notify UCB within forty-five (45) calendar days of receipt of the product or report that it is unacceptable. If UCB receives no such notification, it will assume that the product or report is acceptable.

IV. PERIOD OF PERFORMANCE

Work under this Task Order shall begin on 06/01/2004 and terminate on 06/30/2005

V. PROJECT SCHEDULE

List of Tasks	Start Date	End Date
1. Compliance Evaluation	6/1/2004	3/31/2005
2. Systems Engineering Model	6/1/2004	6/30/2005

VI. BUDGET

A. UCB will be reimbursed for hours worked, in accordance with the Cost Proposal, which is attached hereto and incorporated by reference.

B. In addition, UCB will be reimbursed for salary direct costs, other direct costs, and indirect costs that are identified in the attached cost proposal.

C. This Task Order authorizes UCB to expend up to $175,000 on this task. The Cost Proposal details the budget. This is a single-year funded Task Order. UCB shall not commence work, or exceed any fiscal year allotment, as listed below, without the approval of the Department' Contract Manager.

Fiscal Year	Contract Allotment
2004-2005	$175,000
2005-2006	$*******.**

The budget shall include the following:

- Personnel Services *(including any necessary fringe benefits)*
- Operating Expenses and Equipment
- Material and Supplies
- Subcontracts
- Travel and Per diem
- Indirect Cost

D. The Department may elect one of the following budgetary options:

1. Detailed line item budget.
   (Optional when establishing specific line item budget) "The Department agrees that UCB may effect line items shifts of twenty percent (20%) of direct costs in the Task Order budget without formal amendment of this Task Order or the Department' approval."
2. "Not-to-exceed" budget of a specified amount.
   Such a budget shall be inclusive of the specified hourly rates, fringe benefits, and other direct and indirect charges. The cost proposal shall be of sufficient detail in the Task Order so that the cost of work required for each deliverable can be easily identifiable.
3. The Department has the option to request a shift in funding as deemed appropriate from one line item to another, with UCB concurrence.

VI. PROJECT MONITORS

A. The Contract Monitor for the Department will be Lee Provost.

B. The Principal Investigator for UCB will be Martin Wachs

CCIT Project manager, other UCB/CCIT key personnel: Hamed Benouar

VIII. SIGNATURES

IN WITNESS WHEREOF, this Task order has been executed under the provisions of the Master Interagency Agreement No. 51A0255 between the State of California, Department of Transportation, and the Regents of the University of California. By signature below, the parties hereto agree that all terms and conditions of this Task Order and Master Interagency Agreement No. 51A0255 shall be of full force and effect.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

By _____
Fred Dial,
Senior Transportation Planner
Operations Division

Date 6-16-04

THE REGENTS OF THE
UNIVERSITY OF CALIFORNIA

Signed Subject to
Transmittal Letter
Dated 6/11/04

By _____
Authorized UCB Representative
Jannet Kim
Senior Research Administrator
Non-Federal Program
Sponsored Project Office
University of California Berkeley

Date 6/11/04

Distribution: The Department (3 copies)
UCB

SE PROPOSAL

PERIOD OF PERFORMANCE

~~7/1/04~~ 7/1/04

	Monthly Rate	# months	Unit	%	06/30/05	
Academic Personnel						
1 Graduate Student Researchers, step 3	$2,971	0	summer	100.0%	$0	[1]
	$2,971	0	acad. mo	49.5%	$0	
	$3,030	4	acad. mo	49.5%	$5,999	[2]
	$3,030	2	summer	100.0%	$6,060	
Staff Personnel						
Principal Development Engineer	$8,467	3	cal. yr.	20.0%	$5,080	[1]
	$8,763	9	cal. yr.	20.0%	$15,773	[3]
Administrative Support					$2,202	**
TOTAL PERSONNEL					**$35,114**	

Employee Benefits	Rates Per Period	
Academic personnel	17.0%	$0
Staff personnel	22.0%	$4,588
GSR, summer	3.0%	$182
GSR, Academic Year	1.3%	$78
GSR, Full Fee Remission - $3,207 per semester		$3,207
TOTAL EMPLOYEE BENEFITS		**$8,055**
TOTAL PERSONNEL & BENEFITS		**$43,169**
Equipment		
misc.		$1,200
TOTAL EQUIPMENT		**$1,200**
Subcontract		
		$120,000
TOTAL SUBCONTRACT		**$120,000** *
Travel		
Local Trips		$2,500
TOTAL TRAVEL		**$2,500**
Other Direct Costs		
Misc Supplies		$858
TOTAL OTHER DIRECT COSTS		**$858**
TOTAL DIRECT COSTS		**$167,727**

Indirect Costs	**MTDC**	
10% of Modified Total Direct Costs	$72,727	$7,273
TOTAL AMOUNT REQUESTED		**$175,000**

[1] 10/02 salary rate

[2] Salary rate plus a projected 2% cost of living increase effective every October 1st.

[3] Salary rate plus a projected 3.5% cost of living increase effective every October 1st.

* Indirect costs calculated on first $25,000 of each subcontract only

** Per the negotiated July 1, 2001 Memorandum of Understanding between the California Department of Transportation (Caltrans) and the Regents of the University of California (UC), Caltrans Task Orders and RTAs include a pooled Administrative Support charge equivalent to 6.69% of all project salary costs. The invoicing of this pooled charge, representing the departmental administrative support cost of payroll, accounting, tech support and post-award contract services, is a function of total research salary expenditures. Additional information on file.